NTP client 12

10 synchronization node

synchronization device

network card (eth0)

network card (eth1)

1

11a

11b

5
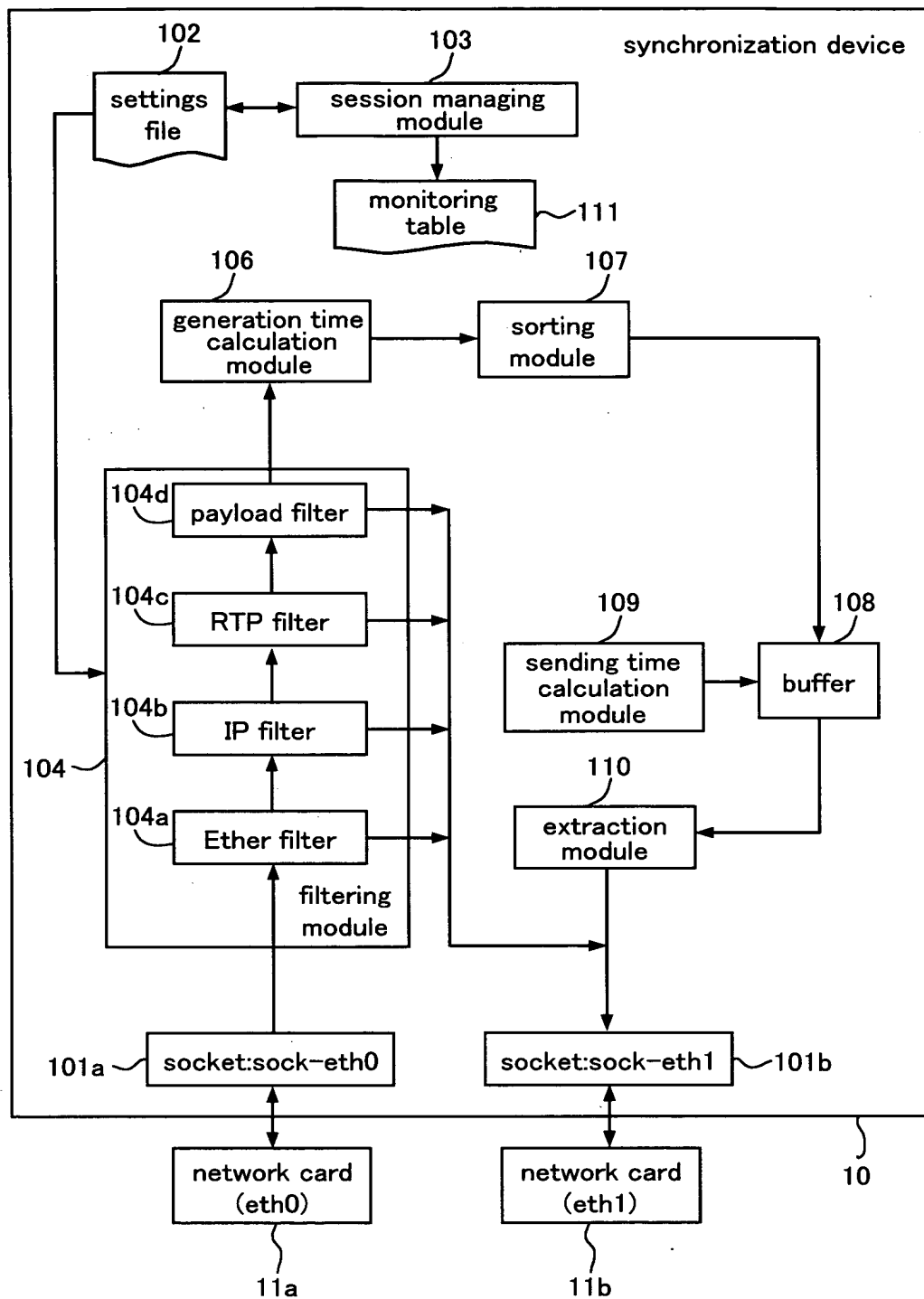
NTP server

2a

2b

2c

2d

4a

3a

3b

4b

3c

Fig. 1

Fig. 2

```
# Group_1 Settings
Group_1_Name: English Conversation Class
Group_1_Comment: Flow Group for English School
# Source Specification
Group_1_Src: 12.345.678.910, 6970, 96
Group_1_Src: 12.345.678.910, 8090, 97
Group_1_Src: 98.765.432.198, 6970, 96
Group_1_Src: 98.765.432.198, 8090, 97
# Destination Specification
Group_1_Dst: 56.789.123.456, 6974, 96
Group_1_Dst: 56.789.123.456, 6972, 97

# Group_2 Settings
        .

        .
```

10

Fig. 3

Synchronization System
Flow Group

Group Name	Comment / Explanation		
English Conversation	Group of AAA English School	select	delete
Tutoring (Math)	Group of Math Class at BBB Private Tutoring School	select	delete
Tutoring (Physics)	Group of Physics Class at CCC Private Tutoring School	select	delete

New Group   Group Name [＿＿＿＿＿]

             Comment [＿＿＿＿＿]

[Create]

Fig. 4

http://localhost/admin/group1

Synchronization System Settings

Source Specifications

IP Address	Port Number	Payload Type		
12.345.678.910	6970	audio (uLaw) ▽	Change	delete
12.345.678.910	8090	video (Mpeg4) ▽	Change	delete
98.765.432.198	6970	audio (uLaw) ▽	Change	delete
98.765.432.198	8090	video (Mpeg4) ▽	Change	delete
		▽	Add	

Destination Specifications

IP Address	Port Number	Payload Type		
56.789.123.456	6974	audio (uLaw) ▽	Change	delete
56.789.123.456	6972	video (Mpeg4) ▽	Change	delete
		▽	Add	

Fig. 5

Source IP Address	Port Number
12.345.678.910	6970
12.345.678.910	8090
98.765.432.198	6970
98.765.432.198	8090

111

Fig. 6

preamble	destination address	source address	type	data	FCS

Fig. 7

version	header length	service type	packet length		
identifier			flag	fragment offset	
time to live		protocol	header checksum		
source IP address					
destination IP address					
options			padding		
IP data					

Fig. 8

SourcePort	DestinationPort
Length	Checksum
Data Main Portion	

Fig. 9

V	P	X	CC	M	PT	Sequence Number
RTP Timestamp (timestamp)						
Synchronization Source Identifier (SSRC)						
Application Data						

Fig. 10A

V	P	RC	PacketType(200)	Length
Synchronization Source Identifier (SSRC)				
NTP Timestamp				
RTP Timestamp				
Number of Sent Packets				
Number of Sent Bytes				
Synchronization Source Identifier of Source				
Fraction Lost	Cumulative Number of Packets Lost			
Highest Sequence Number Received				
Interarrival Jitter				
Time of Last Sender Report Packet				
Time Since Last Sender Report Packet				

Fig. 10B

RTP Packet $\boxed{\cdots \mid \text{timestamp TS}_i \mid \cdots}$

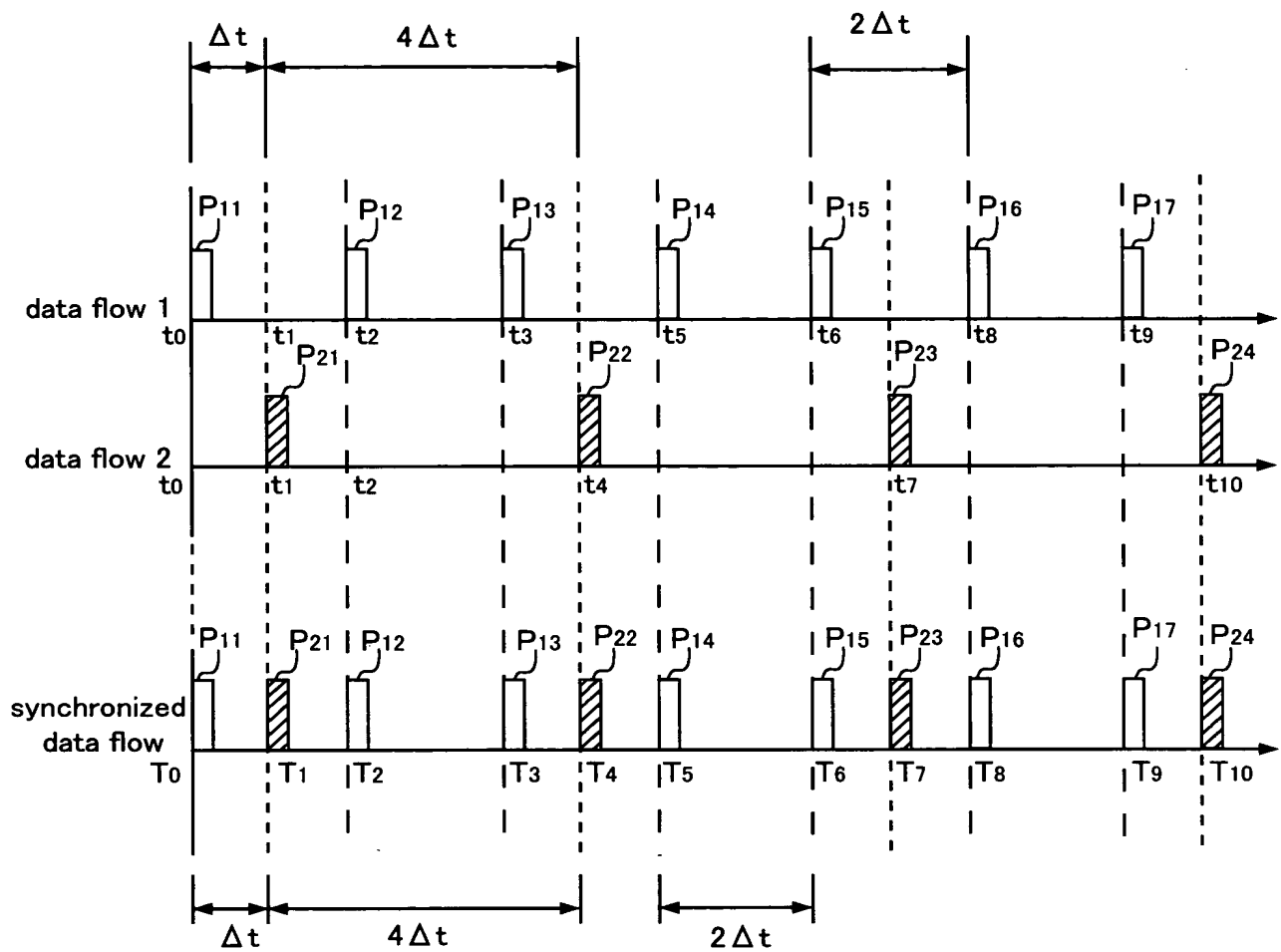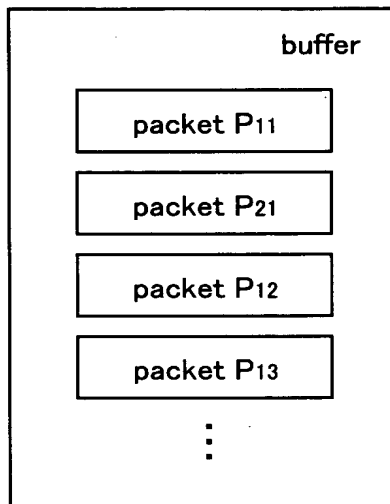RTCP Packet $\boxed{\cdots \mid t_s \mid \text{timestamp TS}_0 \mid \cdots}$

$$t_i = t_s + \frac{TS_0 - TS_i}{\text{number of clock cycles}} \quad \cdots(1)$$

Fig. 11

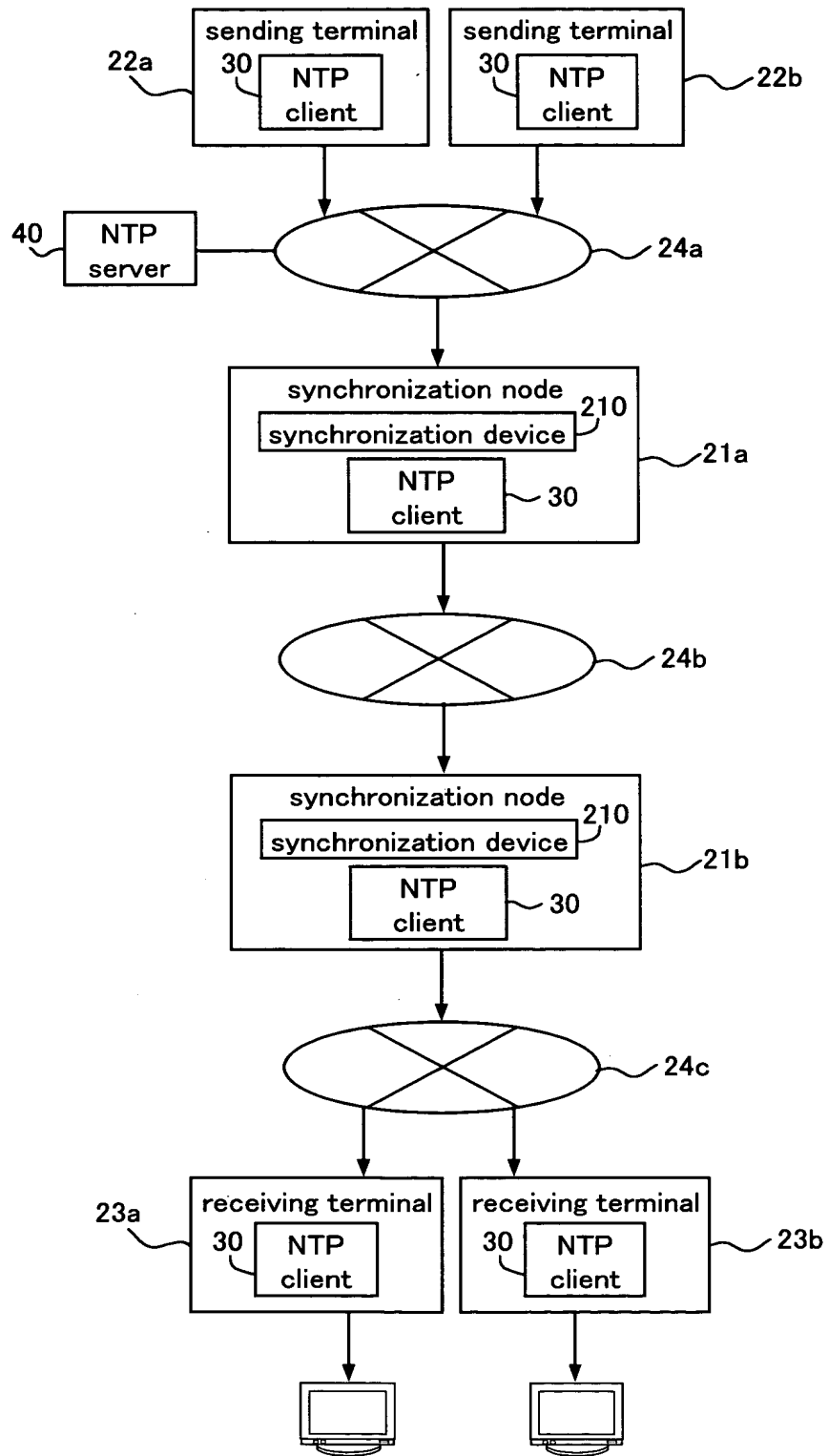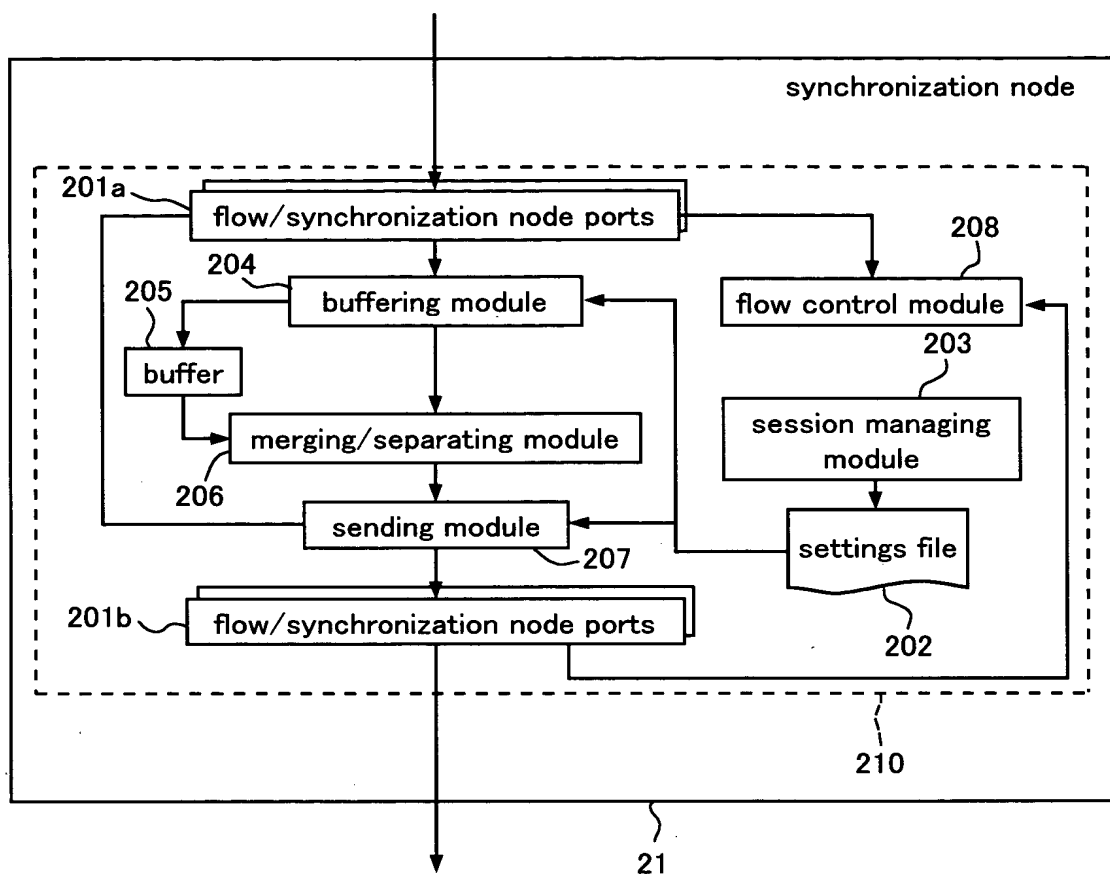*Fig. 12*

buffer

packet P11

packet P21

packet P12

packet P13

$\vdots$

Fig. 13A

buffer

T_0 packet P11

T_1 packet P21

T_2 packet P12

T_3 packet P13

$\vdots$

Fig. 13B

Fig. 14

Fig. 15

synchronization node

201a flow/synchronization node ports

204 buffering module

205 buffer

merging/separating module

206

sending module 207

201b flow/synchronization node ports

208 flow control module

203 session managing module

settings file

202

210

21
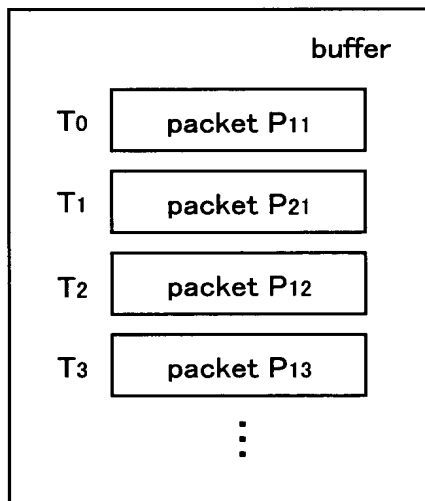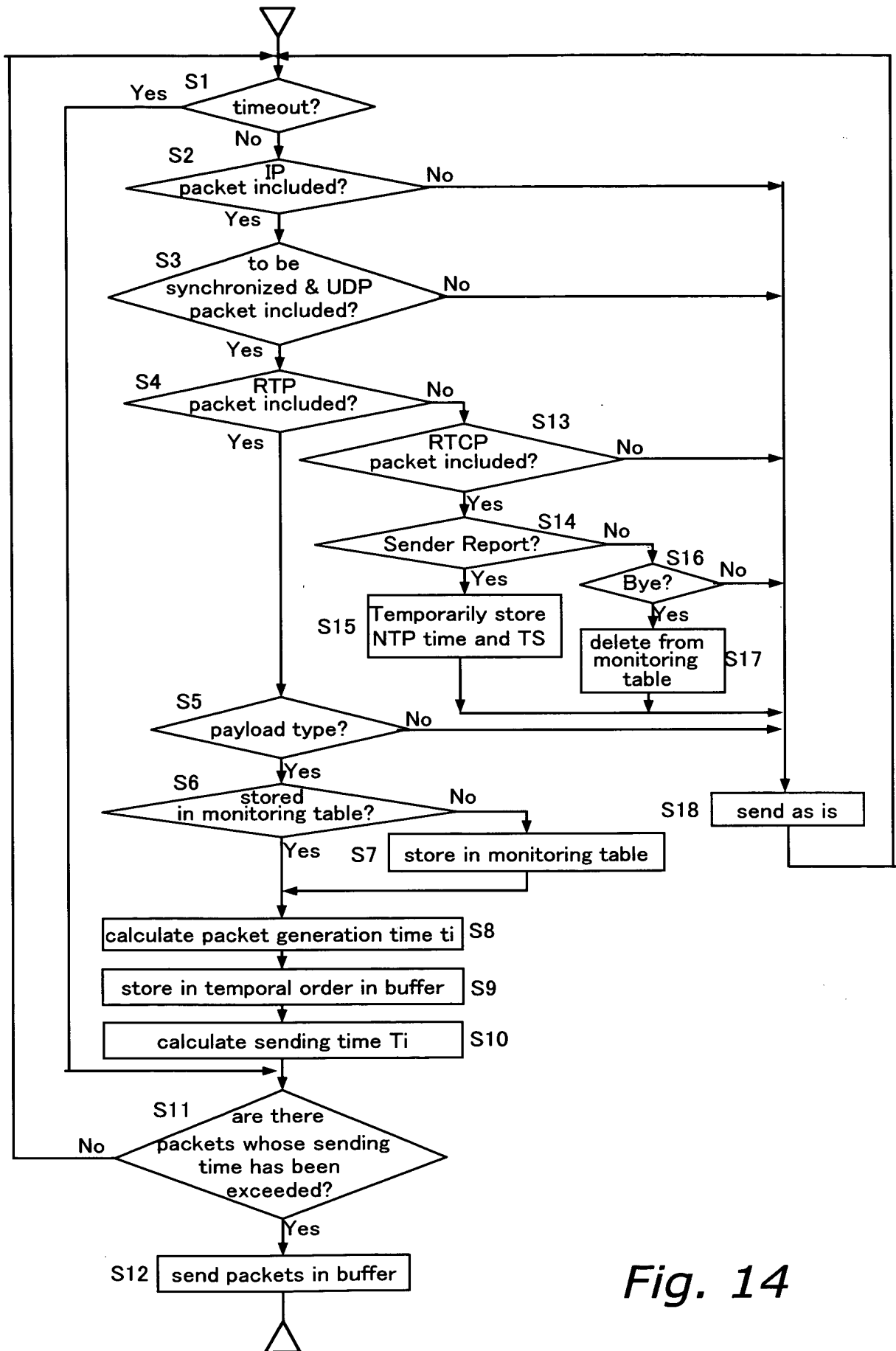
Fig. 16

```
# Group_1 Settings
Group_1_Name: English Conversation Class
Group_1_Comment: Flow Group for English School
# Source Specification
Group_1_Dst: 12.345.678.910, 6970, 1
Group_1_Dst: 12.345.678.910, 6972, 2
Group_1_Dest: 98.765.432.198, 6970, 3
# Settings of Receiver Location
Group_1_Rcv: 8002, 11
Group_1_Rcv: 8004, 12
Group_1_Rcv: 8006, 13
# Merged Data Flow Destination
Group_1_Mix_Dst: 56.789.123.456, 8000
# Merged Data Flow Receiver Location
Group_1_Mix_Rcv: 8000

# Group_2 Settings
      .
      .
```

Fig. 17

http://localhost/admin/

Synchronization System
Flow Group

Group Name	Comment / Explanation		
English Conversation	Group of AAA English School	select	delete
Tutoring (Math)	Group of Math Class at BBB Private Tutoring School	select	delete
Tutoring (Physics)	Group of Physics Class at CCC Private Tutoring School	select	delete

New Group   Group Name [   ]
           Comment [   ]

Create

Fig. 18

Synchronization System Settings

Destination Settings

IP Address	Port Number	Flow ID		
12.345.678.910	6970	1	Change	delete
12.345.678.910	6972	2	Change	delete
98.765.432.198	6970	3	Change	delete
			Add	

Receiver Location Settings

Port Number	Flow ID		
8002	11	Change	delete
8004	12	Change	delete
8006	13	Change	delete
		Add	

Merged Data Flow Destination Settings

IP Address	Port Number		
56.789.123.456	8000	Change	Clear

Merged Data Flow Receiver Location Settings

Port Number		
8000	Change	Clear

http://localhost/admin/group1

Fig. 19

RTP Header						
V	P	X	CC	M	PT	sequence number
timestamp						
Synchronization Source Identifier (SSRC)						

Individual Headers

Number of Merged Streams

Data Flow 1

Multiplexing Header

flow ID	data length	marker

RTP Header

payload type	timestamp	SSRC	marker

Data Flow 2

Multiplexing Header

flow ID	data length	marker

RTP Header

payload type	timestamp	SSRC	marker

．
．
．

Data Main Portion

Data 1
Mpeg4 data

Data 2
Mpeg4 data

．
．
．

1500byte
(including IP,
UDP headers)

Fig. 20

S201   generate stream/ synchronization node ports

S202   packet received?

S213   timeout?

S203   received from node?

S214   divisional packets?

S204   store in buffer

S217   store in buffer

S205   image?

S218   all divisional packets received?

S206   one frame full?

S219   link packets

S207   packets from all streams received?

S208   buffering timeout?

S215   disassemble packets

S209   merge packets

S216   send to receiving terminals

S210   data size too large?

S211   divide frame

S212   send to synchronization node

Fig. 21